

CLAIMS

1. A flexible electrical elongated device, having a longitudinal axis (X) and suitable for service in a high mechanical load environment, said device comprising:
 - 5 - at least one elongated electrical conductor element,
 - an elongated load bearing component along said longitudinal axis and having an external surface including at least one groove disposed along said longitudinal axis,
said groove being designed for holding said conductor element within it
10 while allowing said conductor element to move substantially radially when said device is bent.
2. A flexible electrical elongated device according to claim 1 wherein said load bearing component comprises:
 - 15 - an internal element along said longitudinal axis (X) and made of axial stiffness material and
 - a polymeric layer bonded around said internal element, said polymeric layer having said external surface.
- 20 3. A flexible electrical elongated device according to claim 2 wherein, said internal element is a rod or a tube suitable for transporting hydraulic fluid, power, lubrication or chemical injection fluids.
4. A flexible electrical elongated device according to claim 2 wherein said
25 internal element is made of a material selected among steel, fiber and composite.
5. A flexible electrical elongated device according to claim 2 wherein said
30 polymeric layer is made of a crosslinked polyethylene or a thermoplastic polymer.

6. A flexible electrical elongated device according to claim 2 wherein said polymeric layer is so elastic that said conductor element is snug fit in said groove, and wherein said conductor element is able to move substantially radially by deformation of said polymeric layer.
- 5
7. A flexible electrical elongated device according to claim 1 wherein, when said device is straight, the cross-section shape of said groove, in a perpendicular plane to said longitudinal axis (X), is oval like, and wherein said conductor element fits with elasticity within said groove.
- 10
8. A flexible electrical elongated device according to claim 1 wherein, when said device is straight, the cross-section shape of said groove, in a perpendicular plane to said longitudinal axis, is defined by two sidewalls substantially parallel to each other and a round like shape bottom wall, and wherein a soft filler material is inserted between said
- 15
- conductor element and said bottom wall.
9. A flexible electrical elongated device according to claim 1 wherein said groove has a helical shape.
- 20
10. A flexible electrical elongated device according to claim 9 wherein the helical angle (T) of said helical groove is comprised between 5 and 85 degrees from the longitudinal axis.
- 25
11. A flexible electrical elongated device according to claim 1 wherein it comprises a plurality of parallel grooves, each one including only one conductor element .
- 30
12. A flexible electrical elongated device according to claim 1 wherein said groove is tight enough to hold said conductor element substantially continuously along said longitudinal axis (X).

13. A flexible electrical elongated device according to claim 1 wherein, said device, being a power submarine cable, it comprises an outer protective jacket surrounding said load bearing component and allowing penetration of seawater in said groove.
- 5
14. A flexible electrical elongated device according to claim 13 wherein, at predefined intervals along said groove, said groove has a maximum width between sidewalls greater than the radial dimension of said conductor element.
- 10
15. An umbilical cable, said cable comprises:
signal cable elements wherein at least one of said signal cable elements is said flexible electrical elongated device according to claims 1.
- 15
16. The umbilical cable according to claim 15 wherein said flexible electrical elongated device is disposed in the core of said cable.
17. The umbilical cable according to claim 15 wherein said flexible electrical elongated device is disposed in a first layer including signal cable elements around a core and/or in a second layer including signal cable elements around said first layer.
- 20
18. The flexible electrical elongated device according to claim 4, wherein said internal element is a central element.
- 25
19. The flexible electrical elongated device according to claim 5, wherein said polymeric layer is an extruded layer.
20. The flexible electrical elongated device according to claim 10, wherein the helical angle (T) is between 50 and 80 degrees.
- 30